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METHOD FOR WORKING MIRROR FINISHED SURFACE PLATE OF PARABOLA ANTENNA
[パラボラアンテナ鏡面板加工方法]

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Inventor: Koichi Takita
Applicant: YAGI ANTENNA CO LTD
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(71) Applicant 000006817
YAGI ANTENNA CO LTD
1-6-10 Uchikanda Chiyoda-ku Tokyo
(72) Inventor Koichi Takita
YAGI ANTENNA CO LTD
(74) Representative 100058479
Patent Attorney Takehiko Suzue (5 others)

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(54) [Title of the Invention] METHOD FOR WORKING MIRROR FINISHED SURFACE PLATE OF PARABOLA ANTENNA

(57)Abstract:

PROBLEM TO BE SOLVED: To dispense with a reinforcement removing and finishing work of a joined part and a plate stress relieving work, to improve the strength and quality of the joined part, to improve the reliability, and to reduce the cost.

SOLUTION: Aluminum plates 1 are joined with each other using a frictional agitation joining method to manufacture a wide flat plate. A plurality of the aluminum plates 1 to be joined are fixed to each other with their joining surfaces in a butted condition, a projection part 20 is inserted between the butted surfaces 21 from a side of the aluminum plates 1 while a rotary tool 18 is rotated at high speed, and traveled at a specified speed. The temperature of the aluminum plates 1 is raised to the recrystallization point by the friction between the projection part 20 and the butted surfaces 21 of the aluminum plates 1, and the butted surfaces 21 of the aluminum plates 1 are joined with each other through the mixing of atoms by substitution. A mirror finished surface plate of a parabola antenna is manufactured by working a flat plate manufactured by the frictional agitation joining method into a parabolic shape by the pressing or drawing.

[Claim(s)]

[Claim 1] The parabolic antenna mirror plane plate processing method characterized by joining two or more aluminum plates by a friction churning junction method, manufacturing a double-width plane plate, processing this plane plate in the shape of a

paraboloid by spinning, and manufacturing a parabolic antenna mirror plane plate.

[Claim 2] The parabolic antenna mirror plane plate processing method characterized by joining two or more aluminum plates by the friction churning junction method, manufacturing the double-width plane plate, processing this plane plate in the shape of a paraboloid by press working of a sheet metal, and manufacturing a parabolic antenna mirror plane plate.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a parabolic antenna mirror plane plate processing method which joins and processes an aluminum plate and manufactures a parabolic antenna mirror plane plate.

[0002]

[Description of the Prior Art] Generally an aluminum plate is used as a mirror plane plate of a parabolic antenna. An aluminum mirror plane plate junction of this kind uses MIG welding and TIG arc welding for the joining of two or more aluminum plates of diameter 2 mphi and the above-mentioned mirror plane plates for the parabolic antennas of large opening diameter are manufactured, and by spinning or press working of sheet metal, an aluminum plate is processed in the shape of a paraboloid, and it is considered as the parabolic antenna mirror plane plate.

[0003] Figure 7 shows the condition at the time of welding the aluminum plate 1 of two or more sheets, for example, three sheets, with the conventional welding processes, such as MIG welding and TIG arc welding, and Figure 8 is a detailed drawing of the weld

bonding section 2. If an aluminum plate 1 is welded with the conventional welding process, as shown in detail in Figure 8, the front-face side welding reinforcement section 3 and the rear-face side welding reinforcement section 4 will be formed in the weld bonding section 2.

[0004] Figure 9 shows the condition of having finish-machined the front-face side welding reinforcement section 3 of the above-mentioned weld bonding section 2, and the rear-face side welding reinforcement section 4 by the grinder etc. In Figure 9, 5 is the front-face side welding reinforcement section finish section, and 6 is the rear-face side welding reinforcement section finish section.

[0005]

[Problem(s) to be Solved by the Invention] When an aluminum plate 1 is comparatively small, as shown in Figure 9, a flat surface can be made by finish-machining the front-face side welding reinforcement section 3 of the weld bonding section 2, and the rear-face side welding reinforcement section 4 by a grinder etc.

[0006] However, although it welds by automatic welding etc. since the weld zone of an aluminum plate 1 is long in welding the big aluminum plate 1 like the mirror plane plate for the diameter parabolic antennas of large opening diameter, it is easy to generate a defect in a weld zone. Moreover, by the welding heat under welding, the thermal expansion of an ingredient, etc., since the aluminum plate 1 is large, even if it is difficult to fix a weld zone to an overall length horizontally and it fixes to a horizontal (less than 0.2mm of differences of elevation) with fasteners, such as a fixture, as shown in Figure 10, the level difference section 7 of front-face side weld bonding and the level difference section 8 of rear-face side weld bonding occur in the weld bonding section 2. Although

this level difference section 7 and eight parts are finish-machined by a grinder etc. with the front-face side welding reinforcement section 3 and rear-face side welding reinforcement section 4 part, the process is very difficult because the finish-machining takes time to finish-machine the whole surface to homogeneity. If a plate is shaved too much at the time of finish-machining as shown in Figure 11, since it is necessary to process the part of the above-mentioned level difference sections 7 and 8 horizontally and gently-sloping as much as possible, the reinforcement of the part 9 which became thin becomes weak, a crack is produced at the time of spinning and there is a defective weld zone etc., a crack will be produced similarly. Moreover, since the design strength of a mirror plane plate needs to be doubled with weld zone reinforcement and needs to cover a part for the fall of a weld on the strength by the rise of the whole mirror plane plate, it has to thicken the mirror plane plate and problems, such as the cost of materials becoming sharply higher, occur.

[0007] This invention solves the above-mentioned technical problem, and reinforcement picking finish-machining of a joint and the distortion picking activity of a plate become unnecessary, and there is also no crack generating of a joint and the reinforcement and the quality of a joint can be improved, and it provides a spinning method for aluminum alloy connection material which can reduce cost and improve dependability.

[0008]

[Means for Solving the Problem] The parabolic antenna mirror plane plate processing method concerning the 1st invention is characterized by joining two or more aluminum plates by the friction churning junction method, manufacturing the double-width plane plate, processing this plane plate in the shape of a paraboloid by spinning, and

manufacturing a parabolic antenna mirror plane plate.

[0009] The parabolic antenna mirror plane plate processing method concerning the 2nd invention is characterized by joining two or more aluminum plates by the friction churning junction method, manufacturing the double-width plane plate, processing this plane plate in the shape of a paraboloid by press working of sheet metal, and manufacturing a parabolic antenna mirror plane plate.

[0010]

[Embodiment of the Invention] Hereafter, Embodiment 1 of this invention is explained with reference to a drawing. This invention joins an aluminum plate 1 using the friction churning junction machine 11 shown in Figure 1, manufactures the double-width plane plate, processes this plane plate in the shape of a paraboloid in press working of sheet metal or spinning, and manufactures a parabolic antenna mirror plane plate.

[0011] Figure 1 shows the outline configuration of the friction churning junction machine 11. In this drawing, 12 is a bed for processing and has the suitable magnitude to which the width of face and length were suitable for the magnitude of a jointing material for corrugated fibreboard. On the above-mentioned bed 12, two or more aluminum plates 1 for junction are laid, for example, the four-corners section is fixed by the fixed device (not shown).

[0012] Moreover, the friction churning splicing-machine style 13 is formed above the above-mentioned bed 12 movable at the longitudinal direction of a bed 12. In addition, in Figure 1, the driven device in the longitudinal direction holds the friction churning splicing-machine style 13. As for the above-mentioned friction churning splicing-machine style 13, a drill 16 with three servo motors is formed, and a rotation drive is

carried out under the maintenance plate 14 at the servo motor 15 on the maintenance plate 14. As for this drill 16, the rotation tool 18 for aluminum plate junction is formed at the tip of the maintenance cylinder 17. This rotation tool 18 has the height 20 which was suitable for the core of this junction disk 19 at the board thickness for junction and through which it passes, and a rotation drive is carried out with a rotational speed which was suitable in the fixed direction shown by the arrow head a at the board thickness for junction while it has the hard junction disk 19 at the tip, shown in detail in Figure.

[0013] Next, the processing actuation in the case of joining an aluminum plate 1 using the above-mentioned friction churning junction machine 11 is explained. As shown in Figure 1 and Figure 2, plate 1, for example, the aluminum plate for junction of two sheets, is laid on a bed 12 so that a mirror plane side may turn into the bottom, and where the plane of composition is compared, each corner is fixed. While inserting a height 20 between abutting surfaces 21 from the flank of an aluminum plate 1, driving a servo motor 15 and carrying out high-speed rotation of the rotation tool 18 in this condition, there is running in the direction which shows the junction disk 19 making contact with the top face of an aluminum plate 1 at a fixed rate. At this time, recrystallizing temperature, for example, about 400 °C, raises aluminum material by friction with a height 20 and the abutting surface 21 of an aluminum plate 1, atoms are mixed by substitution, and the abutting surface 21 of an aluminum plate 1 is combined. At this time, the top face of a joint 22 is fabricated by the plane with the junction disk 19, the pressure welding of the inferior surface of the tongue is carried out to the top face of a bed 12, and it becomes mirror plane-like.

[0014] Immobilization of a joint is necessary just not to fix the aluminum plate 1 whole

and a weld zone strongly but since only the narrow range of the perimeter where the aluminum plate 1 did not become an elevated temperature is so much unlike the case of the conventional weld bonding, the rotation tool 18 touches little heat, and in the case of the above-mentioned friction churning junction method welds, to fix the four corners for around an aluminum plate 1 is unnecessary. Moreover, it is possible to join without distorting a joint 22 by thermal expansion, or not to extend the rotation tool 18 and fix a plane of composition.

[0015] Two or more aluminum plates 1 are joined by the friction churning junction machine 11 as mentioned above, and as shown in Figure 3, and the double-width plane plate 23 is manufactured. Figure 4 expands and shows the churning part of the above-mentioned joint 22. As shown in Figure 4, the top face of a joint 22 is fabricated by the plane with the junction disk 19, the pressure welding of the inferior surface of tongue is carried out to the top face of a bed 12, and there is formed the shape of a mirror plane.

[0016] Next, spinning is carried out with the diaphragm metal mold 31 which shows the double width plane plate 23 which joined two or more above-mentioned aluminum plates 1 by the friction churning junction method in Figure 5. Since the plane plate 23 joined by the above-mentioned friction churning junction method does not deform like weld bonding after having been removed from the bed 12, it is not necessary to add a distortion picking correction, and it can be set to the metal mold for spinning or press working of sheet metal public funds mold as is.

[0017] First, as shown in Figure 5, the plane plate 23 is extracted and it lays in the upper part of metal mold 31, and the center section is extracted with a bolt 32, and it fixes to metal mold 31. In this case, the mirror plane side of the plane plate 23 extracts, and it is

made to touch the metal mold 31. Rotating the diaphragm metal mold 31 in the fixed direction, as arrow head c shows, delivers a pressure applied for the top face of the plane plate 23 with the roller 33 for a diaphragm, and furthermore, this roller 33 for drawing is extracted as an arrow head d shows, and it is moved along with metal mold 31, spinning of the plane plate 23 is carried out, and the parabolic antenna mirror plane plate 34 of the shape of a paraboloid as shown in Figure 6 is formed.

[0018] Figure 6(a) is a side elevation which shows the front view of the above-mentioned parabolic antenna mirror plane plate 34 and for Figure 6(b) there is across-sectional view of the part Although this embodiment showed the example which formed the curl section 35 along with the periphery of the parabolic antenna mirror plane plate 34, it may be formed in other configurations. Moreover, the above-mentioned curl section 35 is formed in the parabolic antenna mirror plane plate 34 and it is possible to fix it to the periphery of the parabolic antenna mirror plane plate 34 by a rivet etc. Furthermore, especially the above-mentioned curl section 35 does not need to be prepared.

[0019] Since the reinforcement section is not formed in a joint 22 and distortion is not produced by joining two or more aluminum plates 1 by the friction churning junction method as mentioned above, and in forming the plane plate 23, either, reinforcement picking finish-machining and a distortion picking activity also become unnecessary, this method can also simplify junction inspection of a joint 22, and experienced technicians are unnecessary. Moreover, since there is also neither a junction defect nor a defect by finish-machining of a joint when the above-mentioned joint 22 is processed into the metal mold for press working of sheet metal or spinning as a set in a paraboloid-like mirror plane, there is also no crack generating of the joint 22 in press working of sheet metal or

a spinning process, and there is no poor diaphragm produced by the roller jump in the case of the spinning by poor finish-machining. Furthermore, since the joint 22 has not hardened, a joint 22 sticks to metal mold, a paraboloidal shape is also fabricated correctly, and figuring is also unnecessary.

[0020] Moreover, since a joint 22 does not need to finish-machine, it is possible for it to be maintained at sufficient reinforcement, and as it is not necessary to double design strength with joint reinforcement, there can be design according to the base material reinforcement of an ingredient, and to form a mirror plane plate thinly.

[0021] Respectively, with every kind of advantage, the cost of materials and floor to floor time could be reduced, the dependability of a joint 22 was improved, and a beautiful product with improved quality and appearance is manufactured easily. In addition, although the above-mentioned embodiment showed the case where the parabolic antenna mirror plane plate 34 was fabricated using the plane plate 23 which consists of an aluminum plate 1 of three sheets, the use number of sheets of an aluminum plate 1 is arbitrary. Moreover, although the above-mentioned operation embodiment showed the case where there was spinning of the plane plate 23, and the parabolic antenna mirror plane plate 34 was formed, press working of sheet metal of the plane plate 23 may be carried out, and, of course, the parabolic antenna mirror plane plate 34 may be formed.

[0022]

[Effect of the Invention] As a full account was given above, according to this invention, there is joining of two or more aluminum plates by the friction churning junction method, the forming of the double width plane plate, and since the paraboloid-like parabolic antenna mirror plane plate was fabricated by press working of sheet metal or spinning,

this plane plate, while reinforcement picking finish-machining of a joint and the distortion picking activity of a plate become unnecessary, has no crack generating of a joint, the reinforcement and quality of a joint can be improved, and cost reductions with improved dependability can be achieved.

[Brief Description of the Drawings]

[Figure 1] A perspective view showing the outline configuration of the friction churning junction machine used for parabolic antenna mirror plane plate processing concerning Embodiment 1 of this invention.

[Figure 2] Drawing showing the rotation tool part for junction of the friction churning junction machine in this Embodiment, and the junction condition of an aluminum plate.

[Figure 3] Drawing showing the condition of the plate joined by the friction churning junction method in this Embodiment.

[Figure 4] Expanded drawing showing a part for the joint joined by the friction churning junction method in this Embodiment.

[Figure 5] Drawing showing the condition in the middle of the process which is carrying out spinning of the mirror plane plate in this Embodiment.

[Figure 6] For (a), (b) are the front view of the completed parabolic antenna mirror plane in this Embodiment, and the side elevation in which carrying out the cross section of a part of this parabolic antenna mirror plane.

[Figure 7] A perspective view showing the condition of the mirror plane plate joined by

the conventional weld bonding.

[Figure 8] A sectional view showing the detail of the weld zone in Figure 7.

[Figure 9[Drawing showing the condition of having finish-machined the welding reinforcement part of the mirror plane plate joined by the conventional weld bonding.

[Figure 10] Drawing showing the condition of having produced the level difference in the mirror plane plate weld zone by the conventional weld bonding.

[Figure 11] Drawing showing the condition of having finish-machined the mirror plane plate which produced the level difference in Figure 10.

[Description of Symbols]

1 Aluminum Plate

11 Friction Churning Junction Machine

12 Bed

13 Friction Churning Splicing-Machine Style

14 Maintenance Plate

15 Servo Motor

16 Drill

17 Maintenance Cylinder

18 Rotation Tool

19 Junction Disk

20 Height

21 Abutting Surface

22 Joint

23 Plane Plate

31 Drawing Metal Mold

32 Bolt

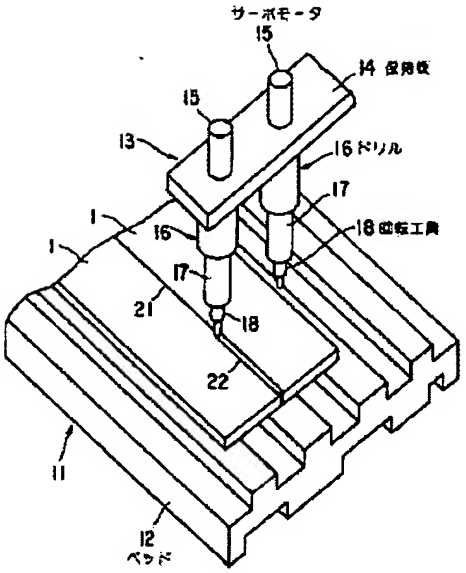
33 Roller for Drawing

34 Parabolic Antenna Mirror Plane Plate

35 Curl Section

(16)

【図１】



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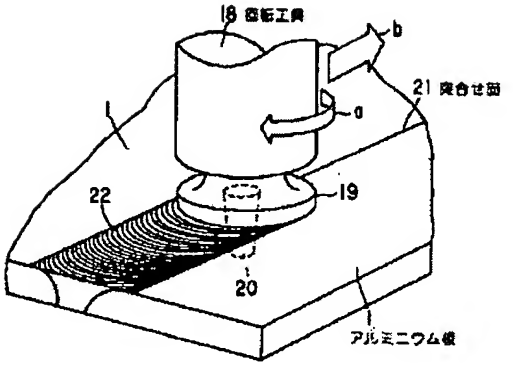

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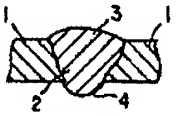

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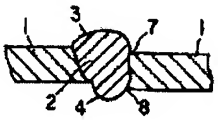

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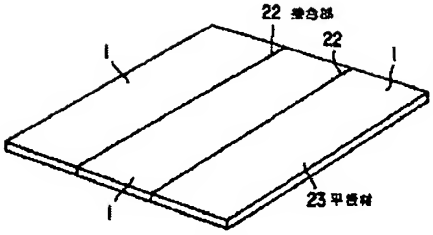

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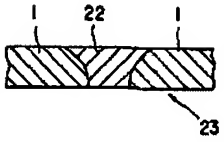

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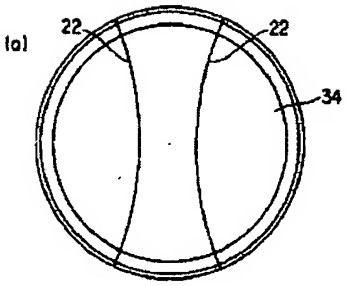

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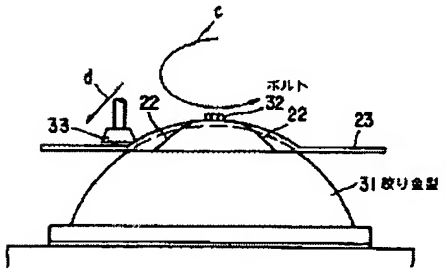

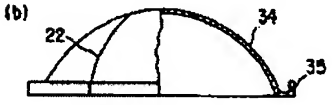

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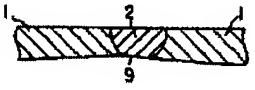

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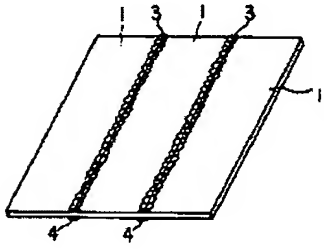

【図9】